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Indians. A number of these palms produce foods, and several provide leaves which are used in making house-thatch, while the trunk of one makes a durable flooring for houses. These matters will be taken up more specifically in the discussion of these subjects. 137 824

Another characteristic plant is the giant bamboo, which grows in clumps at frequent intervals along the banks of the rivers, especially along their lower courses. This bamboo often reaches a height of seventy feet or more, and has a basal diameter approximating ten inches. These immense stems serve various useful purposes, among the most important of which may be mentioned that of joists and rafters in house-building. 137 [342]

There is a great variety of trees in the jungle, many of which produce useful woods. Perhaps the most important uses of wood among the Cayapa are in house construction and in canoe-making. In the former the guayacan, which provides the almost indestructible pillars that support the pile structures, is of greatest importance. Several varieties of trees are used in canoe-making, but two or three kinds are preferred to all others. 137 342 396

Another characteristic of the jungle is the association of many species of plant life together in one area. Whereas in the North Temperate zone it is customary to see large tracts of land occupied by a single principal species of tree, such as the pine, in this Ecuadorian region a considerable number of trees of one species growing close together and in such manner as to form anything comparable with a grove is rarely seen. As a 137

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along these rivers—these are used for hunting or for short trips from the rivers. All the permanent habitations are situated along the banks of the rivers, and to pass from one to another of these, as well as for making trips of greater length, the dug-out canoe, called kā'le, is used. In fact, the canoe is one of the most prominent features of Cayapa life. Everyone begins in early childhood the training which makes him an expert canoeman, and is perfectly at home in a dug-out, whether it be along the smooth sluggish waters of the lower course of the river, in the rapids of the upper course, or out on the ocean coasting to some nearby point.

From the important place the canoe holds in the life of the people, it is natural that much care should be given to its construction and that the art of canoe-making should have reached a high state of perfection. Of the many species of trees in the jungle, only a few produce woods which are hard and tough enough to be suitable for canoe-making. These qualities are found in certain species which have what may be called a criss-cross grain, that is, an interlacing of the wood fiber which makes splitting almost impossible. Though a considerable degree of hardness is required, too great hardness is not desirable. Certain woods, therefore, such as the guayacan, are too hard and heavy to be suitable.

Having found a tree of the desired kind, it is felled with an ax and the canoe is roughly fashioned from a portion of its trunk, as is shown in pl. LXIX, and finally this section is cut loose from the remainder of the tree.

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CANOE-MAKING

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It is then roughly hollowed out with the ax, the sides and bottom being left considerably thicker than is desired in the finished canoe. Frequently it is necessary to do this part of the work at a considerable distance from the river, and even at a considerable elevation above one of the small creeks or esteros tributary to the river. Such was the case with the large canoe shown in pls. LXX, LXXI, which was made at a distance of nearly three miles from the river and two and a half miles from the navigable waters of the nearest estero. Furthermore, the tree from which the canoe was fashioned grew near the top of a ridge about three hundred and fifty feet above the floor of the narrow valley of the estero, and the sides of this ridge were so steep that it was necessary to snub the canoe down to the estero by means of a couple of stout cables. Having worked out such a canoe to approximately its final form, it is turned up on one side and bound to one or two vertical stakes, as shown in pl. LXX. At the same time it is raised a few inches off the ground by means of blocks in order to prevent rotting. It is then allowed to dry and cure in the shade for several weeks.

Finally the owner invites a number of friends to join in hauling the canoe to a point where it may be floated. This task may be a comparatively simple one if the canoe is practically on a level with the river, but if it is at a considerable elevation, much care is needed. Also, the size of the canoe is an important factor. A small canoe may be hauled by one or two persons; but a large one, say one twenty-five or thirty feet in

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483 it does not slide from its course and strike a tree. Finally, when the bottom of the incline is nearly reached, both cables are released and the canoe is allowed to take its course over the remaining short distance to the floor of the valley, its momentum usually carrying it for some yards out on the plain.

Having reached the level of the estero or river, the hauling is now done entirely by hand until the canoe is finally launched. If launched in a small creek, it is often necessary still to haul it by hand for a distance down the creek, since it must be passed over sand-bars and even lifted over large logs, but small ones are always cut away. At last a point is reached where there is sufficient water to float the canoe down to the river. Sometimes, however, it is deemed advisable to haul the canoe only as far as a point on the estero known to be reached by floods; it is then tied to a tree until such time as the back-water of the river extends far enough to allow the canoe to be paddled down to the main stream.

•396 In either case the canoe is finally taken to the house. If it is small, it may be taken into the house, but if a large one, it is more frequently placed under the house [442] or in a nearby grove of palms or trees. It must then be worked and smoothed by means of adz and planes until reduced to the required thickness, and the desired form and finish are obtained, when it is placed in a dry, shady place to season thoroughly before being calked and painted with brea. In adzing the canoe it is placed in a normal upright position and the inner surface

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adzed first. The inner sides are adzed first across the grain and then diagonally to it, and finally the bottom is adzed in a similar manner. This work is done with a hand-adz such as that shown in fig. 10. 396

This tool is of modern introduction, as indeed are the canoes themselves, as well as the method of their manu- 412 [177] [284]

FIG. 10.—Modern adz used in making canoes

facture. The blade of the adz is of steel and is made by local blacksmiths down the river. The wooden handle, shown in fig. 11, is made by the Cayapa, and is so constructed, with the large projection above and with the notches below, that the blade may be securely bound to it, as is shown in fig. 10, by means of pita-fiber string. The blade is concave, and its edge is usually quite regular and curved, so that, while its full width may be [284]

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412 as great as four inches, generally not more than an inch of the edge is in actual play when a blow is struck. The particular adz here shown has a very uneven edge, due to chipping.

[177] The adz is called aswē'la and kū'le mūcte, both of which terms are derived from the Spanish, the second term signifying "canoe machete." The adz handle is called aswē'la tyapi.

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FIG. 11.—Handle of adz

With this hand-adz repeated light blows are struck along one line after another, the lines being parallel, and perpendicular or diagonal to the grain of the wood. By this means the wood is reduced to uniform thickness and the surfaces are rendered comparatively smooth. The final smoothing of the inside of the canoe is done with the adz, but upon the outer surface and along both the inner and outer edges of the gunwales the adzing is followed usually by more or less smoothing with planes, called sepi'ō or sepi'lyū, made after the fashion of the ordinary carpenter's plane. The sides of a large canoe are thus usually reduced to about three-quarters of an inch in thickness, the bottom having a thickness of between two and three inches. The prow and stern of the canoe are carefully cut to the exact form desired and finished with the adz, no plane being needed at these points.

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these points. The form of the prow and stern are characteristic, being very narrow and always very concave on the upper surface of the extreme point, as compared with the negro and the Cholo canoes of this region, thus giving this part somewhat the appearance of a pair of ears. These features are clearly illustrated in the canoes shown in pl. LX. At a distance of from five to seven inches from the extreme point of the prow, there is left a slightly raised line on the upper surface, while on the under surface, at a distance of about three inches from the point, appears a decidedly convex line. The Indians say that the former has no special use, but that the latter serves as a hand-hold in hauling the canoe when landings are made. These two features, together with the hole through which the small mooring cable passes, constitute the only differences between the prow and the stern of the Cayapa canoe.

In general the desired form of a canoe is exactly determined by sighting along it with the eye; but the prow and the stern are carefully measured in order that they may be perfectly symmetrical, and the height of the sides and the thickness of the bottom are similarly measured in order to give the vessel its proper balance.

Having completed the adzing and planing, the canoe is placed under the house and thoroughly dried before calking and painting. Treated in this manner it is of course less liable to check and is more durable. However, canoes are frequently used when green, and those made for sale in the settlements are in most cases only slightly seasoned.

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396 The beeswax for calking and painting the canoe is boiled until of the proper consistency and adhesiveness; this is tested by dropping a small amount of the boiling wax into water and then pressing it between the fingers and also chewing it. The hot wax is applied with a [442] brush about two inches in width, called kū′kū sapa, made of a chisel-edged section of the outer fibrous covering of the coconut.

396 531 The purpose of the wax thus applied to a canoe is strictly utilitarian. Along the outer surfaces of the gunwale, however, are placed various designs in wax for decorative effect. For this purpose certain stamps made of the light soft balsa wood are used. These stamps are of two forms: one, triangular, with a beveled end, is used for line figures and outlines of triangles and other solid devices; the other is cylindrical and its end is used for making dots. The former is called pī ke′ndū, the latter tsū ka′nū. The wax must in all cases be applied while very hot, when it soaks into the wood. In order to keep the wax at the proper temperature, the pot containing it is frequently re-heated, fresh wax being added as this is done. The painting with the coconut-bark brush may be done rapidly and requires little skill; but the making of designs with the dies must be done carefully in order to insure uniformity in size, shape, and spacing. Many canoe-makers, of course, use comparatively little care in this painting, especially on canoes intended for sale. However, a man who takes pride in his work is always exact in applying the ornamentation and spares no time or pains

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in his craftsmanship. The less particular artisan simply paints rude designs with a small coconut-bark brush.

The designs, called kū′m bīlya, used upon canoes are varied. They are largely geometric, consisting chiefly of dots, lines, and triangles, although sometimes animal figures are employed. These last, however, appear only on those canoes made by the Cayapa for sale. On pl. LXXII-LXXV are shown most of the designs used by the Cayapa on canoes made for their own use. They bear no special symbolic significance, none of them is typical of any special group of people, and no individual ownership is connected with any of them. In large measure they bear no names other than the generic kū′m bīlya, literally "canoe design."

As before mentioned, brea is the wax made by certain small bees common to the region. It is called amū′ya, and is of two kinds, black and yellow, the latter being much preferred. The particular bees which produce the brea are of four different species. A small black bee, which lives in hollow trees and is called paba ta′nda, makes the wax of the best quality and in greater quantities than any of the others. Another small black species, called ta′nda also, lives likewise in hollow trees and makes much more honey than wax, but a certain amount of its wax is used. A third species is called ciñemi′skī; it is also black, but builds its nest in the ground and its wax is used to a limited extent. The fourth species is a small yellow bee called amūī a′ma; its wax is black.

Brea is obtained by smoking out the bees and chopping

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cloth, and is placed near the opening at which the bees enter and leave the tree or log. The smudge apparatus is then fanned until a volume of smoke is produced, which in time drives away or stupefies the bees and makes possible the taking of the brea. The wax is found in large blocks, usually at the bottom of the nest, and is cut out with an ax or a machete. It keeps indefinitely, and is stored either in the house or is buried in the ground until needed.

Shortly before or sometimes just after painting the canoe with brea, a hole is cut in the middle of the prow at a point just back of the slightly raised transverse line upon its upper surface, for the cable by which the canoe is moored. This cable, called kondō'pī, consists usually of from two to four strands of carefully selected pitigua twisted together. Such a cable of three strands is shown in pl. XCI, 1. The length of the cable usually varies according to its diameter and the number of its strands, governed by the size of the canoe for which it is made. For very small canoes, frequently a single strand of pitigua is sufficient, but in most cases a two-strand cable is required; very large canoes have three-strand and sometimes even four-strand cables. In making a cable it is necessary first to twist each of the pitigua strands separately, the bark of the strands first having been removed. By means of this twisting the strand is rendered pliable, as well as stronger, since the fibers, which ordinarily would be parallel, are forced to twist around one another. The twisted strand is now wound round a hooked stick, such as that used in cleaning the

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283 cane and plantain fields, and is allowed to dry for a few hours, usually over night. The two or more strands to be twisted into the cable are next tied in a simple knot at one end and the strands passed, one or more, on each side of an upright support. Six or eight feet of pitigua are then unwound from the hooked sticks, and each stick is taken by a person and the pitigua twisted, all strands, of course, being twisted in the same direction. After a sufficient amount of torsion has been secured in these strands, another person takes up the knotted end of the cable and begins to twist the strands together on the opposite side of the upright. In reality he does not himself twist these strands together—he merely pulls sufficiently to bring them out on his side of the upright so that the accumulated force of torsion in the separate strands twists them together into a two- or three- or four-ply cable, as the case may be. This is done very slowly, the worker twisting and pulling here and there in such manner as to cause the strands to twine round one another evenly, producing a cable of uniform size and strength throughout. The strands are unwound from the hooked sticks as rapidly as they are twisted together on the opposite side of the upright, until finally, when the ends of the strands are reached, the cable is prevented from untwisting by another simple knot or by a more or less intricate weaving of smaller strands of pitigua about the main strands of the cable, as shown in the illustration above mentioned and in a manner similar to that represented in greater detail in pl. CIII, 19, 20. This last is the more usual form of

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securing this end of the cable, since it is necessary to have one end small in order to pass it through the opening in the prow of the canoe or for whatever other purpose it may be used. Ordinarily the cables are not tied about the prow of the canoe, but are simply passed up through the hole in the prow above mentioned, the knot in the cable below the prow holding it securely.

For ordinary purposes of travel and for carrying regular loads the canoe above described is sufficient. If, however, an excessively heavy or bulky and unstable cargo is to be transported, it is necessary to increase the buoyancy or to steady the canoe by means of outriggers, called by the Spanish name balsas, Cayapa na'na. In this region the term *balsa* has four significations. It is primarily a raft or float of any kind, and is the term naturally applied to the rafts of logs or bamboo which the Indians float down the river for sale at the settlements. The same term is applied to the outriggers used on canoes, as also to the tree and its wood from which these are made. This wood is very light, even when green or water-soaked, and when dry it is as light and soft as cork, qualities which make it very useful in numerous ways. The chief uses of balsa wood, however, are due to its buoyancy: it will carry in water much more than its own weight, and it is therefore used in rafting such heavy timber as guayacan. In this process, as many logs of balsa are procured as are necessary to sustain the weight of the guayacan, and these are lashed together into a float, the guayacan timbers being lashed on top of them. The guayacan timbers

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to maintain a precarious balance. Children from about the ages of nine to thirteen may have small canoes /kahile/ made for them, which may be seven to eight feet in length, and scarcely a foot in width. At these ages boys begin to accompany their fathers into the monte where the canoes are roughed out by axe and adze. They learn to select the proper trees as only those that are tightly cross-grained will not split easily. Occasionally canoes are roughed out at some height above the creek or rivulet that feeds into the main channel and in the process of carefully snubbing them down the boys learn to rig lines. A large canoe, about thirty-five feet long, may require almost a dozen men to bring it into the water from the monte, whereas a small canoe can be brought in by two or three men. Despite the fact that by the time the boys have reached their late teens they have acquired a large measure of skill in handling canoes, their canoes are nevertheless not considered finely finished until they have had several more years of experience.

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Paddles: /yámpa/. The oar is roughed out with a machete, and the finer lines are cut with a knife.

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